ENTOMOLOGICAL NEWS

VOLUME LXVII, 1956

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PUBLISHED BY
THE AMERICAN ENTOMOLOGICAL SOCIETY
THE ACADEMY OF NATURAL SCIENCES
PHILADELPHIA, PENNSYLVANIA, U. S. A.
1956

The numbers of ENTOMOLOGICAL NEWS for 1956 were mailed at the Post Office at Lancaster, Pa., as follows:

No. 1—January .....January 9, 1956
No. 2—February .....February 3, 1956
No. 3—March .....March 26, 1956
No. 4—April .....April 13, 1956
No. 5—May .....May 5, 1956
No. 6—June .....May 28, 1956
No. 7—July .....July 13, 1956
No. 8—October .....September 24, 1956
No. 9—November .....October 30, 1956

The date of mailing the December, 1956, number will be announced on the last page of the issue for January, 1957.

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January and subsequent issues for 1956 positively not mailed unless subscription has been paid.

ENTOMOLOGICAL NEWS

JANUARY 1956

Vol. LXVII **No. 1**

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PUBLISHED MONTHLY, EXCEPT AUGUST AND SEPTEMBER, BY
THE AMERICAN ENTOMOLOGICAL SOCIETY
PRINCE AND LEMON STS., LANCASTER, PA.
AND
1900 RACE STREET, PHILADELPHIA 3, PA.

Subscription, per yearly volume of ten numbers: $5.00 domestic; $5.30 foreign; $5.15 Canada. Entered as second-class matter April 19, 1943, at the post office at Lancaster, Pa., under the Act of March 3, 1879. Acceptance for mailing at the special rate of postage provided for in paragraphs (d-2), Section 34.40, P. L. & R. of 1948, authorized April 19, 1943.

ENTOMOLOGICAL NEWS

ENTOMOLOGICAL NEWS is published monthly, excepting August and September, by The American Entomological Society at Prince and Lemon Sts., Lancaster, Pa., and the Academy of Natural Sciences, 1900 Race Street, Philadelphia 3, Pa., U. S. A.

PHILIP P. CALVERT, Editor Emeritus. R. G. SCHMIEDER, Editor. Editorial Staff: H. J. Grant, Jr., E. J. F. MARX, M. E. PHILLIPS, and J. A. G. REHN.

Subscription price, per yearly volume of 10 numbers: Domestic, $5.00; Foreign, $5.30; Canada, $5.15—U. S. Currency.

SUBSCRIPTIONS: Communications and remittances to be addressed to **Entomological News, 1900 Race Street, Philadelphia 3, Pa.**

ADVERTISEMENTS: Rate schedules available on request. Address, **Fred B. Jacobson, Advertising Manager, Entomological News, 1900 Race Street, Philadelphia 3, Pa.**

MANUSCRIPTS and all communications concerning same should be addressed to **R. G. Schmieder, Zoological Laboratory, University of Pennsylvania, Philadelphia 4, Pa.**

The receipt of all papers will be acknowledged and, if accepted, they will be published as soon as possible. If not accepted, authors will be so advised and postage requested for return of manuscripts. Articles longer than six printed pages may be published in two or more installments, unless the author is willing to pay for the cost of a sufficient number of additional pages in any one issue to enable such an article to appear without division.

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ENTOMOLOGICAL NEWS

VOL. LXVII JANUARY, 1956 No. 1

Observations on Several Characters which have been used as Primary Differential Criteria in the Classification of the Cyrtacanthacridinae (Orthoptera; Acrididae)

By JAMES A. G. REHN

To many non-systematic zoologists classification is regarded as a hide-bound worshipping of morphological characters. The fact is that classification represents, as truly as any other aspect of biological research, a constant and seemingly endless reaching for reasonable permanency or for the verities, and this just as impersonally as in any of the other fields of research, which are now so generally and pedantically referred to as "disciplines." The individual freedom of thought or of reasoning, which the inference of discipline proscribes, is a fundamental need in evolving a reasonable solidity or warranty in classification. To achieve this objective it is essential in the light of our constantly broadening knowledge, that we reexamine or weigh anew the relative value, or perhaps more properly the relative soundness, as criteria, features which have either long been used, or may be brought out *de novo,* as basic analytic characters. While we may not as yet be in the position to substitute other criteria of greater phylogenetic value, we can at least call attention to past misconceptions or over-stressings, and in this way draw attention to matters which may trap the unwary student. The few features here discussed are presented with that thought in mind.

The presence or absence of an apical spine on the external margin of the caudal tibiae has long been considered a major criterion for dividing the "spine-breast" locusts, or Cyrtacan-

thacridinae, into subsidiary divisions. This feature was first employed by Stål in 1875,[1] and it has been stressed in most of the classic taxonomic locust studies which have appeared in the past three-quarters of a century. The basic value of this feature, however, has been questioned at times by various authors, and the present one, in studies of several natural groups published in the last dozen years, has shown definitely this spine may be present or absent in genera which clearly are members of the same natural stocks.[2] It is quite probable that numerous tribes of locusts differ consistently in the presence or absence of this spine; it is equally certain that in others its presence or absence has no outstanding phylogenetic value. An appraisal of its worth as a key character hence depends on the particular complex involved.

Another feature which has been utilized a great deal in the past as a primary character, separating whole assemblages of locust genera, is the presence in certain genera of lamellate extensor margins to the caudal tibiae, the sections between the marginal spines, and especially distad, being very definitely, and sometimes quite strongly, lamellate, occasionally extended appreciably laterad. This condition produces marked rims to the transversely concave extensor surface of the caudal tibiae, giving the same the physical characteristics of a spoon oar. We now know that this development is correlated in a number of genera with hygrophilous habits, and it is fair to assume it is so associated in those in which it occurs, as similar habits are known to

[1] Discussed in Bihang K. Svenska Vet. Akad. Handl., 3, no. 14, pp. 23–25, (1875). Elaborated in same serial, 4, no. 5, pp. 11, 17, (1876), and 5, no. 4, pp. 1, 7, 11, (1878). Given greater emphasis and primary position by Brunner in 1893 in his classic "Révision" (Ann. Mus. Civ. Stor. Nat. Genova, XXXIII, pp. 133, 137).

[2] "The Locusts of the South American Generic Group Tristirae (Orthoptera; Acrididae; Cyrtacanthacridinae)." Trans. Amer. Entom. Soc., LXVIII, pp. 31–100, (1942). Variation in presence or absence of apical spine mentioned on page 37 and elsewhere in the paper.

"A Review of the Old World Euthymiae (Orthoptera, Acrididae, Cyrtacanthacridinae)." Proc. Acad. Nat. Sci. Phila., XCVI, pp. 1–135, (1944). Reference should be made to page 7 and page 13, on the latter involving two sets of closely related genera.

be present in certain genera of the Tetrigidae and in the Paulininae of the Acrididae, which have such habitat preferences. Sufficient evidence is now available to show that this specialization is not a basic feature, that other genera of the same tribes, probably of less hygrophilous and more generalized habits, do not possess lamellate borders to these tibiae, although in the sum total of their other characters they are closely related to genera which do have these developments. Perhaps the genera lacking these lamellations are more primitive, and hence less divergent from their basic stock. There is also some evidence of an intermediate condition in at least two tribes known to me, i.e., the Oxyini and the Opshomalini. In some genera of these entities there is a fine but very distinct raised carina present in the usual position of the interspinal lamellations, while in the genera of the same in which the caudal tibiae are typical non-lamellate or non-carinate there is no trace of any sculpture there, and the shaft of the tibiae is evenly rounded in cross-section.

In the female sex of certain locusts we find some outstanding parallelisms in the general form and details of the ovipositor valves, clearly indicative of adaptations of these organs to special conditions of oviposition. In the Asiatic, Indo-Malayan, Papuan and Australian genus *Gesonula,* of the tribe Oxyini, and in the Neotropical genus *Cornops,* of the tribe Opshomalini, we find marked similarity in the unusual development of the ovipositor valves, although the cerci and subgenital plate development of the male sex are entirely different, and along the basic lines found in the other genera of the respective tribes.[3] We know that both of the above mentioned genera are hygrophilous, but their ovipositing process[4] is probably different from that of other related genera, some of which are known to be equally

[3] For further discussion of this parallelism reference is made to a recent paper by the author (Trans. Amer. Entom. Soc., LXXVIII, p. 118, (1952)). The ovipositor valves of *Gesonula* are being figured in the treatment of the Oxyini in Vol. III of "The Grasshoppers and Locusts of Australia," now in course of publication.

[4] According to Ramakrishna Ayyar and Krishna Menon (Journ. Bombay Nat. Hist. Soc., XXXVI, p. 517, (1933)) *Gesonula* (there discussed as the preoccupied *Gesonia*) oviposits in the succulent stems of taro, and by other authors it is stated to be partial to rice fields.

hygrophilous, yet have definitely different types of ovipositor development.

The placement of the eggs can be a most exacting requirement for the future of the species, and in consequence egg-laying apparatus fully serving this purpose, and in the requisite material, is important from the standpoint of survival. In weighing the classificatory value of these features it must be realized that at times we have within a single natural group of genera several lines, each adapted to life in somewhat different environments, and the requisite specialization, as far as appendages is concerned, is sometimes as marked in the female external genitalia, which are concerned with oviposition, as in any other structural features. Those ovipositing in grass, in woody fiber, or in soft vegetable tissue, as well as in soils of various textures or hardness, often show pronounced modifications of the shape, character and armament of the ovipositor jaws, as well as of other appendages involved in the process.

Grants-in-aid at North Carolina 1956–1958

Eleven National Science Foundation Grants-in-Aid will be made for research work at the Highlands Biological Station, Highlands, North Carolina for the summers of 1956–1958. The proposed research must be concerned with the fauna or flora of the Southern Appalachians and may involve any of the various fields of biology. Applications will be received from any College or University, and they must be submitted in triplicate not later than March 1 of each year.

The following will be available: four (4) postdoctoral grants of $500.00 each, three (3) predoctoral of $400.00 each, and four (4) graduate student grants, open to students who carry out their research proposal under the direct supervision of a principal investigator.

Application blanks or information may be obtained from the Executive Director of the Highlands Biological Station, Professor Thelma Howell, Department of Biology, Wesleyan College, Macon, Georgia.

Synonymic Notes on Nearctic Pompilinae (Hymenoptera: Pompilidae)

By Howard E. Evans, Cornell University, Ithaca, N. Y.

Four years have elapsed since the publication of my taxonomic study of the Nearctic Pompilini (1950–51, Trans. Amer. Ent. Soc., 75: 133–270, 76: 207–361, 77: 203–340). During this period I have seen much additional material of the group, necessitating reinterpretation of certain species; also, a number of new species have been described, some of which require comment. It has seemed desirable to publish these notes at this time in order to make them available for the forthcoming supplement to the Synoptic Catalog of Hymenoptera of America North of Mexico.

Perhaps a few preliminary remarks on the subject of intraspecific variation are in order. I know of no character in these wasps which is not subject to variation, and this most certainly includes the male terminalia. Each character of each species must therefore be thought of in terms of a mean and range of variation. As additional specimens are discovered, it is inevitable that some will extend slightly the known range of variation of certain characters. The indiscriminate naming of such variants as new species adds nothing but confusion to the systematics of an already difficult group. It should also be remembered that each specimen has developed on a single host spider. Anyone who has observed pompilids in the field is aware that a given female may take spiders of many different sizes for provisioning her successive nests. A large amount of variation in size of the progeny is therefore to be expected, and linear measurements of body parts, used by themselves, are of virtually no value as specific characters. While the ultimate decision as to what is a species and what is not is partly subjective in a group not readily amenable to experimental work, there is little to justify the naming of isolated specimens on size, on minor differences in head measurements, or on small differences in the shape or number of setae on various parts of the male terminalia.

Aporus (Aporus) niger (Cresson)

Planiceps niger Cresson, 1867, Trans. Amer. Ent. Soc., 1: 136.
Aporus (Aporus) hermes Bradley, 1944, Trans. Amer. Ent. Soc., 70: 94–95. ♀, ♂. NEW SYNONYMY.

As additional material in the genus *Aporus* has accumulated, it has become apparent that the several characters used to separate *hermes* from *niger* are all highly variable. These include the shape of the apex of the mesosternum of the female and the shape of the subgenital plate and parameres of the male. The two subgenital plates illustrated by Bradley appear to represent extremes in variation, and most of the males before me fall somewhere between them. Recently Marius S. Wasbauer collected a series of both sexes of *niger* at Luling, Texas, in which all three of the above characters vary all the way from "*niger*" type to "*hermes*" type. I can therefore see no alternative to adding *hermes* to the already rather long list of synonyms of the highly variable *Aporus niger*.

Allaporus rufiventris (Cresson)

Aporus rufiventris Cresson, 1872, Trans. Amer. Ent. Soc., 4: 207.
Euplaniceps aquilonaris Dreisbach, 1952, Ent. News, 63: 94–97. ♂. NEW SYNONYMY.

Dreisbach's description of *aquilonaris* appeared to extend the range of the genus *Euplaniceps* from South America to California. Although he compared the species with the Chilean *E. sausseri* (one assumes he meant *saussurei* Kohl), he failed to mention why it might not be an *Allaporus*. As a matter of fact, the type and single known specimen (MCZ, no. 29313) is merely a male of the widely distributed *A. rufiventris*. While it is true that the genitalia of *Euplaniceps* and *Allaporus* are strikingly similar, perhaps indicating a close relationship, nevertheless there are several excellent generic differences. For example, the venation of the hind wing of *Euplaniceps* is of more or less "normal" pompilid type, while that of *Allaporus* is very different (Evans, 1950, Ent. News, 61: 4).

Anoplius (Arachnophroctonus) xerophilus Evans

Anoplius xerophilus Evans, 1947, Ent. News, 58: 10–14.
Arachnophroctonus gaigei Dreisbach, 1954, Amer. Midl. Nat., 52: 438–439. ♂. NEW SYNONYMY.

In the past few years I have seen a number of additional specimens of this species, extending the known range well into Mexico and as far east as Pecos and Uvalde, Texas, and also extending the known range of variation of several characters. Dreisbach's *gaigei,* described from a single specimen from the Davis Mts., Texas, falls well within the range of variation of *xerophilus.* The differences cited in the width of the volsellae, in the length of the parameres, and in the width of the front and vertex, are all of a very minor nature, and all concerned with characters which exhibit much variation in the series now before me. I have not seen the type of *gaigei,* which is said to be at the University of Michigan.

Anoplius (Pompilinus) clystera (Banks)

Pompiloides clystera Banks, 1914, Jour. N. Y. Ent. Soc., 22: 302.
Pompilinus submarginatus Dreisbach, 1952, Amer. Midl. Nat., 48: 146–147. ♂. NEW SYNONYMY.

The species *submarginatus,* described from a single male from Delta, Utah, was compared by the describer with *marginatus* Say and *truncatus* Dreisbach, but not with *clystera* Banks. The type locality is near the center of the range of *clystera* and the description and photographs fit that species nicely.

Anoplius (Pompilinus) estellina (Banks)

Pompiloides estellina Banks, 1914, Jour. N. Y. Ent. Soc., 22: 303.
Pompilinus utahensis Dreisbach, 1952, Amer. Midl. Nat., 48: 145–146. ♂. NEW SYNONYMY.
Pompilinus minutus Dreisbach, 1952, Amer. Midl. Nat., 48: 147–148. ♂. NEW SYNONYMY.

The genitalia of *estellina,* although showing a certain amount of variation, are highly characteristic, particularly because of the

abrupt expansion at the apex of the aedoeagus and the straight, somewhat club-shaped parapenial lobes. Although the parameres of *minutus* are said to be much narrower than *estellina,* they are not in fact as narrow as in some specimens of *estellina* before me. Dreisbach compares *utahensis* with "*P. incitus* Evans," apparently a *nomen nudum,* but strangely enough not with either *estellina* or *minutus.* Again it is a case of failing to make allowances for intraspecific variation. The photographs of the genitalia and subgenital plates of *utahensis* and *minutus,* published on facing pages, are strikingly similar, and quite like the photographs of *estellina* which Dreisbach included in an earlier paper.

Anoplius (Pompilinus) marginatus (Say)

Pompilus marginatus Say, 1824, Narr. Exp. St. Peter's River, II, p. 333.
Pompilinus basirufus Dreisbach, 1952, Amer. Midl. Nat., 48: 149–150; *Pompilinus basirufous* [*sic*] Dreisbach, 1952, ibid., p. 158. ♂ (♀ misidentified). NEW SYNONYMY.

This species, described from Gainesville, Florida, on the basis of minor differences in the male terminalia from *marginatus,* in fact falls well within the range of variation of that species. The type, which I have examined in the MCZ (no. 29328), is a male possessing the usual series of short erect hairs on the hind basitarsus which is characteristic of *marginatus.* The female allotype is, however, a specimen of *A.* (*P.*) *splendens* (Dreisbach). *A.* (*P.*) *marginatus* is not uncommon in Florida, and males from that state usually have considerable red on the abdomen, as described for *basirufus.*

Anoplius (Anoplius) imbellis Banks

Anoplius imbellis Banks, 1944, Bull. Mus. Comp. Zool., 94: 169.
Anoplius subimbellis Dreisbach, 1952, Amer. Midl. Nat., 48: 155–156. ♂. NEW SYNONYMY.

Little comment on this synonymy is necessary except to say that the single specimen on which Dreisbach based *subimbellis*

in my opinion falls within the range of variation of *imbellis*. Although the type is said to be in the MCZ, it has not been deposited there as of this writing, more than three years after the publication of the description.

Anoplius (Anoplius) piliventris (Morawitz)

Pompilus piliventris Morawitz, 1889, Hor. Soc. Ent. Ross., 23: 122.
Anoplius basalis Dreisbach, 1950, Amer. Midl. Nat., 43: 578. ♂. NEW SYNONYMY.

I have suspected the above synonymy for some time, but only recently have been able to obtain specimens of *piliventris* for comparison. Raymond Wahis, of Embourg, Belgium, recently loaned me a male and a female *piliventris*, and these compare favorably in every detail with *basalis*, including the structures of the male terminalia. Thus *piliventris* becomes the fourth pompiline wasp known to be Holarctic in distribution.

Pompilus (Hesperopompilus) jacintoensis Evans

Pompilus (*Hesperopompilus*) *jacintoensis* Evans, 1948, Proc. Ent. Soc. Wash., 50: 146–148.
Pompilus (*Hesperopompilus*) *evagetoides* Evans, 1951, Trans. Amer. Ent. Soc., 77: 217–218. ♂. NEW SYNONYMY.

Harry A. Hill, of San Diego, Calif., has recently taken an excellent series of both sexes of *jacintoensis*. The males are the same as the form I described as *evagetoides*, which thus falls as a synonym. The single male specimen originally associated with *jacintoensis* and described as allotype of that species remains for the moment without a name and without association with any female.

Pompilus (Ammosphex) anomalus (Dreisbach)

Anopompilinus anomalus Dreisbach, 1950, Amer. Midl. Nat., 42: 725–726.
Anopompilinus arnaudi Dreisbach, 1952, Amer. Midl. Nat., 48: 153–154. ♂. NEW SYNONYMY.

The characters used by Dreisbach for separating these two species (the shape of the subgenital plate and of the submarginal

and discoidal cells) are notoriously unreliable in this subgenus, and the single specimen upon which *arnaudi* is based falls well within the range of variation of *anomalus*. Again, the type has not been deposited in the MCZ as promised, and I have therefore not seen it.

Pompilus (Arachnospila) arctus Cresson

Pompilus arctus Cresson, 1865, Proc. Ent. Soc. Phila., 4: 453.
Pycnopompilus parvus Dreisbach, 1952, Amer. Midl. Nat., 48: 152–153. ♂. NEW SYNONYMY.

I have already discussed the variation of certain characters in this species (1951, Trans. Amer. Ent. Soc., 77: 258–260) and criticized Dreisbach for applying five different names to the species. He has now added a sixth, based on a single specimen having the apex of the volsella more narrowly expanded than usual. Using Dreisbach's criteria, I could easily describe several additional "species" from the material before me, for the terminalia of this species are variable indeed, although nevertheless distinctive of the species.

A New Geophiloid Chilopod from Chile

By Ralph V. Chamberlin

Among millipeds secured by Drs. Hans Brattström and Erik Dahl on the Lund University Chile Expedition of 1948–49 was found a new species of the recently erected genus *Pandinium* which was not detected in time for inclusion in the general report on the chilopods of that expedition. The new form is therefore here separately described.

Genus **Pandinium** Chamberlin

Pandinium Chamberlin, 1955, Reports of the Lund University Chile Expedition 1948–49, No. 18, The Chilopoda, p. 18.

The following species is the seventh in the genus to become known, all of them occurring in Chile and none known from elsewhere.

Pandinium cryptum new species

The cephalic plate longer than wide, widest in frontal region from where moderately narrowing caudad, the anterior corners widely rounded, the posterior more narrowly rounded or somewhat oblique; no frontal suture; the surface coarsely punctate throughout.

Basal plate trapeziform, long, prebasal plate absent or concealed.

Prehensors much exposed laterally and in front, the claws when closed attaining the distal end of the second antennal articles; claws with a tooth at base and femuroid with a similar tooth at distal end within. Prosternum with two teeth on anterior margin; surface punctate.

Clypeal spot single and rather large; set off only by the reduced size of its areolae, not punctate; a pair of large setae, one toward each lateral margin. Ectad of each of these setae a pair of setae obliquely placed. Lateral pieces of labrum meeting at the median line in front of the abortive middle piece.

Palpus of first maxilla bearing a lappet from its first joint; syncoxite without lappets. Coxae of second maxillae separated.

Anterior tergites with a median depression or shallow furrow and one each side of this which disappears on the more caudal segments. Last tergite somewhat shield shaped, the caudal end narrowly rounded.

All spiracles circular, the first much larger than the second.

Sternites with a more or less distinct median sulcus. The last sternite trapeziform, rather wide. Coxal pores small and separate; about eight on ventral surface each side of sternite and four or five in a series close to edge of tergite on each side.

Anal pores present.

Pairs of legs, 49.

Length, near 28 mm.

Locality.—CHILE: Llanquihue Prov., Petrohue, at western end of Lago Todos los Santos. One female taken Dec. 26, 1948, by Brattström and Dahl (their No. T.16).

Probably nearest to the highland species *P. alticolens,* but distinct in such features as having the clypeal spot sharply areolate instead of punctate, the longer prehensors, etc.

Cryptops gynnis nom. nov. (Chilopoda)

Cryptops gynnis nom. nov.

Proposed for *C. debilis* Chamberlin (1955) which is preoccupied by *C. debilis* Bücherl (1950, Mem. Inst. Butantan, 22, p. 181). Kindly called to my attention by Dr. O. Schubart of Pirassununga, Brazil.

R. V. CHAMBERLIN

Notes on the Life History of Cephenemyia phobifer Clark (Diptera)

By R. L. Blickle, Durham, N. H.[1]

The published records, Hadwen (1926) and subsequent authors, have shown that mature Cephenemyia larvae are expelled from the nose of the host and pupate in the ground. The larvae of Cephenemyia have been collected from various parts of the host, especially from the regions of head and throat. Herman (1946) mentions that newly-hatched larvae have been found in the stomach and intestines. In the present instance the larvae of *Cephenemyia phobifer* Clark were collected in deer feces. The evidence seems to indicate that the mature larvae actually left the host through the alimentary canal and were passed out with the feces. The circumstances concerning the collection of the larvae are set forth below.

Three puparia of *Cephenemyia phobifer* Clark were obtained from Mr. Nicholas Colovos, of the New Hampshire Agricultural Experiment Station, at Durham. Two of the puparia were collected on April 16, 1955, and one was found on April 17, 1955. The puparia were found in deer feces during the course of nutritional studies on white-tailed deer. The deer droppings were kept in a deep freeze unit from the time of collection until they were taken out to be analyzed. The puparia, along with the feces, were taken out of the deep freeze unit on May 2, 1955. It was then that the three puparia were discovered. Since the puparia resemble, to some extent, deer droppings, they could easily be overlooked unless one were familiar with dipterous puparia.

The puparia were turned over to the writer on May 2. They were then placed in glass jars and kept at room temperature. One female *Cephenemyia phobifer* Clark emerged on May 8, 1955. This fly came from the puparium taken on April 17. No flies have emerged from the other two puparia, six months after they were found in the feces. The failure of the two pu-

[1] Published with the approval of the Director of the New Hampshire Agricultural Experiment Station as Scientific Contribution No. 184.

paria to produce flies may be due to their having been stored for 18 days in a deep freeze, at approximately 0° F. If the normal time for larval emergence from deer in New Hampshire is late April or early May, the puparia would not be subjected to such a low temperature.

During certain phases of the nutritional experiments the deer were confined to cages in order to facilitate the collection of feces and urine. The cages were constructed in such a manner as to make it impossible for the deer, confined in them, to turn around. Pans were placed beneath the cages for the collection of the urine and feces, the pan for the urine being closer to the head of the animal. The pans made of galvanized iron, measured 6 inches by 12 inches by 12 inches. Thus, if the larvae had emerged from the head of the animal they would have had to crawl back from the head a distance of three feet past the pan for collecting urine, and climb up six inches of galvanized iron to have been found with the feces. Since all three puparia were found with the feces this would not appear to be the case.

The larvae of *Cephenemyia phobifer* Clark are found in various regions of the head and throat of the white-tailed deer. One of these regions in the deer is the nasal pharynx. It is quite likely that larvae infesting the region of the nasal pharynx could drop into the alimentary canal and pass out with the feces. It is possible that this method of leaving the host may be a normal one for the larvae of *Cephenemyia*.

The author wishes to thank Dr. Joseph Bequaert for confirming the identification of the fly.

Literature Cited

Hadwen, S. 1926. Notes on the life history of *Oedemagena tarandi* L., and *Cephenomyia trompe* Modeer. J. Parasit. 13: 63–65.

Herman, C. M. 1946. The nose bot fly of deer. Cal. Fish and Game 32 (1): 17–18.

A New Species of Scorpion of the Buthidae: Centruroides pantheriensis

By Herbert L. Stahnke, Poisonous Animals Laboratory, Arizona State College, Tempe, Arizona

This is a case of a new species of scorpion first being recognized by a physiological characteristic. When the first specimen was received from Big Bend National Park, Texas, it was identified as *Centruroides sculpturatus* Ewing. At the same time a request was made for more scorpions of that area since it was so far afield from this species' known range. Observation of juvenile forms revealed that the fifth caudal segment was of a dark brownish color which became lighter in succeeding molts. As a result, the fifth caudal segment in the adult appeared as though it were merely dirty. In all other respects, to the naked eye, the scorpion was an exact replica of *C. sculpturatus.* A test by biological assay of its venom indicated that it was more like that of *Centruroides vittatus* (Say) and *Centruroides chisosarius* Gertsch than *C. sculpturatus.*

Centruroides pantheriensis, new species

General Appearance: Foundation color of trunk and cauda a yellowish-brown, often referred to as a straw-color because of the perfect blending of a specimen when resting on a bale of straw. Like *C. sculpturatus,* the adult has no readily observed markings such as dorsal stripes or spots. Fifth caudal segment slightly darker than other segments.

Carapace: Entire surface covered with coarse granules interspersed with fine granules. All margins equipped with a single row of coarse granules which are largest on the anterior margin, more uniform on lateral margins and most irregular on posterior margin. A ring of diffuse dark brown pigment circles the median eyes, becoming more dense in region of median furrow of ocular tubercle. Median groove well developed and passing rather deeply through ocular tubercle producing pronounced superciliary crests. Anteromedian edge broadly emarginate, making frontal lobes rather angular. Three lateral eyes on each

side of equal size, arranged in a straight line and flanked behind by row of coarse granules, many of which are darkly pigmented. Carapace shorter than fifth caudal segment as well as movable finger of pedipalps.

Dorsal Preabdomen: Complete, markedly granular, median keels on all terga except seventh on which this keel extends over only the anterior half. Seventh tergum has, in addition, two well granulated lateral keels on each side of tergum. No dark spots or stripes, or bands on either sex.

Ventral Preabdomen: Abdominal sterna, in the main, smooth except for seventh which bears four distinct keels with intercarinal spaces well granulated. Coarser granules found more laterally.

Middle lamellae of pectines unequal and oblong. Number of pectinal teeth: ♀ 25, ♂ 28. Male teeth somewhat larger than those of female and extended nearer to proximal end. Anterior and posterior margins of basal piece of male sub-parallel while posterior margin of basal piece of female extends caudally into a rounded lobe, thus making female basal piece longer than genital operculum. Female basal piece also has a short, distinctly marked transverse groove just above the middle. Genital papilla of male not conspicuous.

Postabdomen: Superior and inferior keels exceptionally granular and well developed on all segments except fifth. Median lateral keels entirely absent on this segment in both sexes. Male with all fifth-segment keels poorly developed which gives segment a cylindrical appearance. Female with all intercarinal spaces rather densely covered with coarse granules; male with granules not only smaller but fewer in number. Female with row of larger granules extending about two-thirds the distance anteroposteriorly on each side of inferior median keel of fifth segment; these granules less noticeable on male.

Telson: Vesicle, or ampulla, of female more globular in shape and somewhat more granular than on male. Both sexes only sparsely covered with moderate-sized to small bristles. Subaculear tooth-like protuberance present. Aculeus shorter than ampulla with distal half darkly pigmented.

Pedipalps: Fingers long and quite slender. Interior border of movable one with nine median oblique rows of granules. This includes a short apical row and the more indistinct proximal row. Latter may be indistinctly separate from one immediately distal to it; especially true on female. These rows flanked on each side by a row of granules that in the main are tooth-like; from 30–32 such granules on inner row. Most distal point of both movable and immovable fingers with a tooth-like granule much larger than any of other digital granules, and flanked on each side by a thin leaf-like membranous sheath and proximally by two darkly pigmented and very thick bristles. All four structures so closely compact as to give the general appearance of merely a large tooth-like structure. Pedipalps with well developed and heavily granulated keels. Intercarinal spaces of female with more and larger granules than male.

Variations: Second instar with fifth caudal segment a dark brown and contrasting strongly with rest of segments. Segments I–IV with only a dark median ventral stripe which gradually becomes fainter anteriorly. Sometimes, pigment around median eyes not formed into a diffuse ring at this stage. In those cases where it is, a diffuse streak may extend toward lateral eyes. Ridges of paired posterior median keels of carapace distinctly marked with dark brown pigment. In some cases, this fans out laterally in a rather diffuse manner. Above markings become less distinct in each succeeding instar until adult condition, as described, is reached. Second instar with entire aculeus a reddish brown which sometimes extends diffusely into ampulla. Subaculear protuberance appears as well developed, sharply pointed tooth. As scorpion gets older, this tooth-like condition changes to a more papular protuberance.

Pedipalps and other appendages of second instar with same general color or very slightly lighter than rest of body. Hands of pedipalps may or may not be slightly darker than fingers and other body parts.

Related Species: From standpoint of venom reaction this species is closely related to *C. vittatus* and *C. chisosarius.* In rats, a venom injection of 0.15 mg./100 gm. weight from any one of

these three species produces only a local swelling of fair proportions at site of injection. Leg receiving venom slightly favored; convulsions or drooling not produced. Venom, in same quantity, of *C. sculpturatus* and *C. gertschi* does not produce swelling at site of injection but does produce heavy drooling, violent convulsions and death within one hour.

As stated previously, *C. pantheriensis* closely resembles *C. sculpturatus* in overall appearance. Adults of new species differ in having fifth caudal segment very slightly darker in color than segments I–IV and a diffuse ring of pigment circles the median eyes. *C. pantheriensis* with fewer but larger coarse granules on carapace while on terga of preabdomen coarse granules fewer than on *C. sculpturatus*. On *C. pantheriensis* basal piece of the pectines same length or longer than gential operculum. On *C. sculpturatus,* basal piece shorter than operculum. Caudal segments and chela hands of pedipalps more robust in *C. pantheriensis* than in either *C. chisosarius* and *C. sculpturatus*. In color *C. chisosarius* differs from *C. pantheriensis* in having other areas besides median eyes marked with dark brown irregular maculations and in having preabdomen in both male and female marked with dark brown longitudinal bands. These bands less distinct on female, and in some preserved specimens may fade so as to be hardly perceptible.[1] *C. pantheriensis* entirely devoid of dark markings on the preabdomen *in both sexes.*

From a random sampling the average number of pectinal teeth are as follows: *C. pantheriensis* ♀ 24.9, ♂ 27.7; *C. chisosarius* ♀ 25.2, ♂ 27.1; *C. sculpturatus* ♀ 21.7, ♂ 24.1.

Records: All from Big Bend National Park, Texas. Holotype ♀ 1554, Panther Junction, 7/3/55 (collected by David J. Jones). Allotype ♂ 1620 (Danny Sholly and Bobby Sims) and six paratypes from same locality as holotype: ♀ 1544, 6/23/55 (Roy Curbow); ♂ 1536.2, 6/13/55 and ♀ 1561, 7/6/55 (D. J. Jones); ♂ 1549, 6/28/55 (George Miller); ♂ 1632, 8/17/55 (Roy Lassitor); ♀ 1553, 7/2/55 (Danny Sholly). Three paratypes from Boquillas Ranger Station: ♀ 1582, 7/29/55; ♀ 1534, 6/10/55; ♂ 1636, 8/22/55 (all by John Palmer). One paratype from Chisos Basin: ♂ 1623.1 8/8/55 (Earl Steel). Three

[1] All color determinations were made on living specimens.

paratypes from Boquillas Crossing: ♀ 1589.1, ♀ 1589.2, ♂ 1589.3, all on 7/30/55 (H. L. Stahnke). Two litters born in captivity. One ♀ with young taken. Also, twenty-two additional adults of both sexes.[2]

Type locality: Panther Junction, Big Bend National Park, TEXAS. *Holotype* found on bedroom floor of residence. *Allotype* found on cushion of chair on porch of another residence.

The name "pantheriensis" from Panther Junction, Big Bend National Park, Texas, was suggested by Assistant Superintendent David J. Jones. This species is abundant in and around the dwellings of this area.

Observations on the Feeding Behavior of Several Pselaphid Beetles

By MANFRED D. ENGELMANN, University of Michigan

INTRODUCTION

Beetles of the family Pselaphidae are small predators which inhabit the floor strata of forests and prairies. Several reports have been made on the feeding habits of this family. The majority of these observations concern pselaphids that are associated with ants. *Ceophyllus monilis* LeC. has been observed eating a larva of the ant, *Lasius aphidicola* Walsh (Park, 1932). Park (1933) reports that *Tmesiphorus costalis* LeC. is a facultative synoekete in the nests of *Aphenogaster fulva* Rogers, where it preys upon the ant brood. *Batrisodes globosus* (LeC.) is reported to eat mites (Oribatidae, Hoplodermatidae, and Gamasidae), worms and broods of ants (Park, 1947). Park (1942) states that pselaphid beetles feed upon insect larvae, Collembola, and Acarina. Aside from this general statement, little is known about the feeding habits of non-myrmecophilic species.

[2] Additional data to be given in a forthcoming paper on "Scorpions of Big Bend National Park."

This paper briefly describes feeding habits of several pselaphids preying upon other organisms which are associated with them in leaf and log mold. Five different species of pselaphid beetle were observed: from Champaign County, Illinois, one male *Cedius spinosus obsoletus* Park, one male *Batrisodes globosus* (LeC.), one male and one female *Bibloplectus* sp., and two female *Euplectus* sp.; from Oak Ridge, Tennessee, one male *Tmesiphorus costalis* LeC. and one male *Euplectus* sp.

I wish to thank Dr. Orlando Park and Dr. Stanley Auerbach for their helpful suggestions with the manuscript, and Dr. Park for his identification of the observational material.

Materials and Methods

The organisms used in these observations were collected in two ways. The larger beetles were obtained by searching the litter or rotting logs in an oak-hickory forest and were captured by means of camel's-hair brush or aspirator. The smaller pselaphids were obtained by the Berlese funnel method (Park et al., 1954). A beaker of water was set under the funnel to receive the insects. Collembola, mites, small beetles, and other minute organisms were supported by the surface film of the water in the beaker and stayed alive for several days. The water surface made it difficult for these animals to move freely; and hence, they were picked up easily with a camel's-hair brush.

Like the majority of the small arthropods that inhabit the forest floor, pselaphid beetles require high relative humidity in order to survive. Therefore, an observation chamber must maintain high relative humidity and at the same time must be transparent. For this purpose three glass vials, two cm. in diameter and two cm. in height, were used. A small moist piece of cellucotton was packed into the bottom of each vial. A glass coverslip, two cm. in diameter, was fastened with small pieces of cellophane tape over the opening of the vial. The small observation chambers were in turn kept in a covered stender dish in order to protect them and to prevent evaporation. The observation chambers were easy to handle, gave an

undistorted view from above, and held moisture without replenishment for a week or more.

After the beetles were established in the observation chambers, mixed groups of Collembola, including members of the families Entomobryidae, Isotomidae and Poduridae, mites, and insect larvae were introduced into the observation chamber. The activity of the beetles was observed from time to time under a binocular dissecting microscope and light of low intensity was used.

Observations

The beetle that fed most readily under conditions of observation was *Cedius spinosus obsoletus.*

Every time *Cedius* feeds, a consistent attack pattern is exhibited as follows: at first it runs about the chamber in a random manner as the Collembola are being introduced. After the lid is replaced, the beetle begins to move more slowly, holding its antennae out in a wide "V." Upon encountering a suitable entomobryid the beetle extends its antennae forward, holding them rigidly, almost parallel, and slowly approaches the collembolan, until the clubs of the antennae are over the prey. The spinoid projection of the eighth antennal segment is held ventrally. Now the beetle pauses. At the same time the maxillary palpi are extended to their full length. The tips of the last two cone-shaped segments of the palpi are pointed toward the prey, and the last segment twitches back and forth. The beetle slowly advances one or two steps more; then, pausing again, it steadies itself on the meso- and metathoracic legs, and rears up slightly. The next moment the observer sees the collembolan clasped in the grip of the *Cedius.* The actual grasping act is so swift that it is difficult to see. Upon close observation, however, *Cedius* can be seen to lunge forward. Simultaneously the beetle seizes the collembolan with its mouth parts and grasps the prey tightly in the angle made by the apposing tibia and femur of each prothoracic leg. Here an important taxonomic character—the spines located on the ventral surface of the trochanter and femur—takes on a functional sig-

nificance. In the first moments of the encounter, while the collembolan is thrashing violently in an attempt to free itself, *Cedius* maintains a firm hold on its prey with the aid of the mantid-like grip of its prothoracic legs. The spines press into the cuticle of the prey and help to maintain the grip. As soon as the collembolan ceases to struggle, the beetle's prothoracic legs loose their grasp. The beetle now maintains its hold only with the mouth parts. The prey is carried to a quiet corner to be consumed.

Collembola of the family Entomobryidae seemed to be a favored food of *Cedius*. Other food, however, is also taken. At one point, when hungry, *Cedius* was observed to eat small campodeiform coleopterous larvae. A large collembolan of the family Isotomidae, introduced with the Entomobryidae, laid some eyes which developed and hatched in the chamber. The young isotomids went through two molts and lived for several weeks in the chamber with *Cedius*. Even when the beetle was left without other food for four days, it did not eat the young isotomids. A single podurid was placed in the chamber after *Cedius* had been without food for four days. The beetle approached the podurid, began the characteristic examination of the prey, then turned and left it. After several similar approaches, *Cedius* grasped the podurid and bit into its flesh. Immediately *Cedius* released its hold, and began running about the chamber, with its head down, rubbing its opened mouth parts against the cellucotton floor. Afterward it began an intensive grooming action, drawing its legs through its mouth parts.

After each feeding *Cedius* carefully grooms itself before settling down. For the most part this consists of drawing the prothoracic legs through the mouth parts. The beetle chews at the tibia and tarsus. Then, having withdrawn the prothoracic leg from the mouth parts, it rubs the mesothoracic leg with the leg just groomed. Having thoroughly cleaned the legs, *Cedius* extends a prothroacic leg, and, catching first one antenna and then the other, pulls them down to the mouth parts and cleans the surfaces of the last few segments.

Once, a more elaborate grooming sequence was observed in *Cedius*. It began with the usual drawing of the prothoracic legs and antennae through the mouth-parts. After this act was accomplished, a mesothoracic leg was drawn through the mouth parts in a similar fashion. Then the mesothoracic leg was raised over the back of the abdomen and elytra and placed down upon the anterior margin of the pronotum. The mesothoracic leg was then rubbed posteriorly over the dorsal surfaces of the pronotum, elytra, and abdomen, and once more returned to the mouth parts. This action was repeated a number of times with each mesothoracic leg before the grooming stopped.

Of the other beetles observed, *Tmesiphorus costalis* exhibited approach and attack patterns similar to those of *Cedius spinosus obsoletus*. *T. costalis* is a large pselaphid with the prothoracic legs slightly modified for grasping. Instead of possessing spines, however, the femora and tibiae are armed with stiff brushes of setae. This beetle was observed several times while feeding upon large collembolans of the family Entomobryidae.

One *Batrisodes globosus* and individuals of the genera *Euplectus* and *Bibloplectus* were all observed feeding upon Collembola. *Batrisodes* fed upon individuals of the family Entomobryidae, and was once observed to attack and devour an isotomid. *Euplectus* and *Bibloplectus* fed upon Collembola of the families Poduridae and Isotomidae. The podurids are small, slow-moving collembolans, many of them with the furcella reduced or absent, and are readily captured by these small pselaphids. Isotomids are more difficult to capture because they are as large as these beetles and have the furcella well developed.

Batrisodes globosus, *Bibloplectus*, and *Euplectus* do not usually grasp prey with the prothoracic legs. Upon discovering a collembolan, these beetles hesitate a moment, vibrating the maxillary palpi in the direction of the prey, then lunge forward, grasping the prey in their mouth parts. *Bibloplectus*, when encountering a large isotomid, may hold the collembolan down with its fore-tarsi as if in an attempt to subdue it.

In so far as the author has been able to determine, no data on the longevity of Pselaphinae have been published. With Col-

lembola as the chief food, *C. spinosus obsoletus* lived in the laboratory as an adult for 104 days, before being killed for identification. *Euplectus* and *Bibloplectus* were alive at the time of writing, having lived 107 and 114 days respectively.

Summary

Five species of pselaphids were observed with respect to feeding behavior patterns and choice of food. *Cedius spinosus obsoletus* and *Tmesiphorus costalis* were observed to have a different pattern of attack from that of *Batrisodes globosus, Euplectus* and *Bibloplectus. Cedius spinosus* while in the laboratory rejected all Collembola except those of the family Entomobryidae. It also ate small coleopterous larvae.

Tmesiphorus costalis exhibited the same food preferences as did *Cedius spinosus obsoletus.*

Batrisodes globosus showed less selectivity, feeding on Isotomidae as well as Entomobryidae.

Euplectus and *Bibloplectus* restricted themselves to Isotomidae, and Poduridae.

Bibliography

Park, O. 1932. The myrmecocoles of *Lasius umbratus mixtus aphidicola* Walsh. Ann. Ent. Soc. Amer., 25 (1) : 77–88.

1933. The food and habits of *Tmesiphorus costalis* LeConte. Ent. News, 44: 149–151.

1942. A study in neotropical Pselaphidae. Northwestern Univ. Stud. Biol. Med., (1) : 1–403, 12 pl.

1947. Observations on *Batrisodes* (Coleoptera: Pselaphidae), with particular reference to the American species east of the Rocky Mountains. Bull. Chicago Acad. Sci., 8 (3) : 45–132, 11 pl.

Park, O., and S. Auerbach. 1954. Further study of the tree-hole complex with emphasis on quantitative aspects of the fauna. Ecology, 35 (2) : 208–222.

Essay Review

THE PHYSIOLOGY OF DIAPAUSE IN ARTHROPODS. By A. D. Lees. Pp. x + 151, 25 figs. Cambridge Monographs in Experimental Biology. No. 4. Cambridge University Press. (American Branch, 32 E. 57th St., New York 22.) Price, $2.50.

The morphogenesis of many arthropods is interrupted for prolonged periods of time by a dormancy that may be initiated even during conditions which are optimal for development. Diapause, as such a dormancy is termed, has the apparent adaptive value of anticipating seasonally adverse climatic conditions that are incompatible with feeding and development.

If an arthropod is to enter a period of diapause, it does so at a stage of development characteristic for the species. Among different species, however, the diapausing stage may vary from an early embryo, through all the intermediate stages of development to the imago preparing for gamete production. Diversity such as this, though often serving to cloud one's understanding of the physiology of diapause, has been used to advantage by A. D. Lees in his monograph on the subject. Viewed with proper perspective, such diversity enables one to distinguish the fundamental features of diapause from the special features surrounding its occurrence in any given form.

Lees considers the events, both internal and environmental, which lead first to the onset and then to the termination of diapause. He provides us with a lucid and thoughtful review of experimental evidence derived from such divergent sources as ecology, genetics, biochemistry and endocrinology. Most of the consideration deals with insects; some, largely concerning the author's own research, deals with mites.

Included is a comprehensive discussion of the role of the environment in inducing dormancy in arthropods possessing a facultative diapause. The photoperiod, a reliable indicator of the seasons, is an environmental cue which, according to recent findings, is frequently an effective inducer of diapause. In many cases low temperatures are also effective, and the complex rela-

tions between temperature and photoperiod are discussed with clarity. The amount, quality and water content of the food supply are less frequent determinants of diapause. Conspicuous exceptions to these generalizations, of course, occur and these can often be related to unique factors in the animal's natural history. The final chapter, "Diapause and Phenology," includes a unique account of such relationships.

Significant differences in susceptibility to environmental control occur even between races within a species. Such differences have a genetic basis which has been especially thoroughly analyzed in *Bombyx mori*. Lees proposes that the various genotypes differ primarily in the sensitivity of their respective receptors to environmental factors, some genotypes being relatively indifferent and others more sensitive to environmental control. By extrapolating this concept, he reasons that species with obligatory diapause are hypersensitive to the various diapause-inducing conditions; and thus cannot miss being exposed to an effective stimulus. On the other hand, many species which rarely or never diapause, can be presumed to be insensitive to the required environmental stimuli.

The environment is also effective in determining the duration of diapause. It goes without saying that conditions must be satisfactory for the resumption of morphogenesis. In addition, however, a limited period of chilling, such as that normally provided by a temperate zone winter, will in many forms hasten the termination of diapause after the return of moderate conditions. The author endorses Andrewartha's term, "diapause development" in designating hypothesized but poorly defined processes which must be completed before diapause can terminate. He presumes that, in arthropods whose termination of diapause is hastened by a period of chilling, some component of diapause development must be accelerated by low temperatures.

The role of hydration in the termination of diapause is thoroughly discussed. Among a number of orthoptera with an embryonic diapause, the termination of diapause is accompanied by water absorption by the egg. Whether hydration is a primary cause of the termination of diapause in such cases appears to be a debatable point, despite considerable affirmative evidence in the case of *Melanoplus*. He points out that, since some

orthoptera diapause as fully hydrated embryos, such a mechanism would have to be of limited occurrence.

The inception of diapause is often accompanied by a number of metabolic adjustments which, in extreme cases, include a striking decrease in the rate of metabolism and a concurrent drop in the activities and amounts of certain respiratory enzymes. Lees suggests that these changes are not in themselves causally related to the onset or termination of diapause, but that they are secondary adaptations enabling the individual to economize on the utilization of reserve substances. When enzymatic adjustments to dormancy occur, as in *Melanoplus* and *Platysamia*, the restoration of a normal respiratory enzyme system is prerequisite to the resumption of development.

In recent years there has been a rapid accumulation of evidence indicating that diapause is endocrinologically controlled. The author presents a generally plausible picture of environmental control influencing the central nervous system which in turn controls diapause via endocrine mechanisms. Such a relationship is well established in several cases of larval and pupal diapause in which the brain-activated prothoracic glands terminate diapause by triggering the next molt. More recent evidence suggests that imaginal diapause is terminated via brain-activation of the *corpora allata* which, in the female, stimulate the initiation of yolk deposition. Less clear is the situation in early embryonic diapause where the nervous and endocrine systems have not yet differentiated.

A recently described case of endocrine mediation of the onset of diapause involves the sub-esophageal ganglion whose activity, in *Bombyx mori*, causes the female to lay diapausing eggs. Like the prothoracic glands and the *corpora allata*, the sub-esophageal ganglion must be activated by the brain. The brain is thus a probable site of action of the environmental control of diapause.

In synthesizing the findings from so many different approaches to the physiology of diapause, the author has high-lighted many important remaining problems. This treatise will be an effective stimulus to studies of diapause.—WILLIAM H. TELFER.

NOTICE. The December 1955 issue of ENTOMOLOGICAL NEWS was mailed at the Post Office at Lancaster, Pa., on December 2, 1955.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Conopidae of the World wanted. Will pay 10¢ to $1.00 for pinned and labelled specimens. S. Camras, 4407 N. Milwaukee Ave., Chicago 30, Illinois.

Anisoptera—Nearctic sp. wanted for exchange, espec. Ophiog., Arigom., Aeschna, Neurocor., Somatoc., Cordulia, Dorocor., Leucor. R. D. Cuyler, Dept. of Entomology, N. C. State College, Raleigh, N. C.

Bembicini and Stizini (Hym., Sphec.) of New World wanted for revis. study. Will return upon request or at end of project. James E. Gillaspy, Dept. of Zoology, Univ. Texas, Austin 12, Texas.

Agapema galbina. Will exchange cocoons of this moth for nature books. E. Frizzell, Route 4, Box 96, San Benito, Texas.

Wanted—Data on exact location of colonies of *Epibembex* (olim *Bembix*) (Hymenoptera), any species, any part of country, for biological studies. Howard E. Evans, Dept. Entomology, Cornell Univ., Ithaca, N. Y.

Fanniinae wanted on loan (nearctic and holarctic), and information on collections. James G. Chillcott, Dept. Entom., Univ. of Kansas, Lawrence, Kan. (Loans may be charged to Dr. C. D. Michener.)

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